IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences

In re Patent Application of
BEAN et al.

Atty Dkt. 3638-115 (AMK)
C# M#
Confirmation No. 9134
TC/A.U.: 3634

Serial No. 10/786,164
Examiner: A. Chin Shue

Filed: February 26, 2004
Date: January 21, 2009

Title: BOOM LIFT VEHICLE AND METHOD OF CONTROLLING LIFTING FUNCTIONS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

☐ **Correspondence Address Indication Form Attached.**

☐ **NOTICE OF APPEAL**
Applicant hereby **appeals** to the Board of Patent Appeals and Interferences from the last decision of the Examiner twice/finally rejecting applicant's claim(s). $540.00 (1401)/$270.00 (2401) $

☒ An appeal **BRIEF** is attached in the pending appeal of the above-identified application $540.00 (1402)/$270.00 (2402) $ 540.00

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☐ A reply brief is attached. **(no fee)**

☐ Pre-Appeal Brief Request for Review form attached.

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One Month Extension $130.00 (1251)/$65.00 (2251)
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NIXON & VANDERHYE P.C.
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Signature: /Alan M. Kagen/

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BEAN et al. Atty. Ref.: 3638-115 (AMK)

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For: BOOM LIFT VEHICLE AND METHOD OF CONTROLLING LIFTING FUNCTIONS

* *

January 21, 2009

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

Appellants hereby **appeal** to the Board of Patent Appeals and Interferences from the last decision of the Examiner.

TABLE OF CONTENTS

(I) REAL PARTY IN INTEREST

The real party in interest is JLG Industries, Inc., a corporation of Pennsylvania.

(II) RELATED APPEALS AND INTERFERENCES

The Appellants, the undersigned, and the assignee are not aware of any related appeals, interferences, or judicial proceedings (past or present), which will directly affect or be directly affected by or have a bearing on the Board's decision in this Appeal.

(III) STATUS OF CLAIMS

Claims 1-22 are on appeal in the present application. Claims 1-22 have been rejected. No claims have been substantively allowed.

(IV) STATUS OF AMENDMENTS

No amendments have been filed since the date of the last Office Action.

(V) SUMMARY OF CLAIMED SUBJECT MATTER

The invention relates to boom lift vehicles and, more particularly, to a boom lift vehicle including a tower boom pivotally coupled with a main boom and a method of controlling lifting functions of the boom lift vehicle. With reference to Fig. 1, a boom lift vehicle 10 includes a vehicle base 12 supported by a plurality of wheels 14. A counterweight 16 is fixed to the vehicle base 12 to counterbalance turning moments generated by the vehicle boom components. The vehicle base 12 also houses suitable drive components coupled with the vehicle wheels 14 for driving the vehicle. See page 5, lines 22-26.

A telescoping tower boom 18 is pivotally coupled at one end to the vehicle base 12. A lifting member 20 such as a hydraulic cylinder is disposed between the tower boom 18 and the vehicle base 12 for effecting tower lift functions. The tower boom 18 includes telescope sections that are coupled with suitable driving means (not shown) to effect telescope extend/retract functions. A nose pin 22 of the tower boom is disposed at an uppermost end of the tower boom 18 opposite the end pivotally attached to the vehicle base 12. See page 6, lines 1-7.

A main boom 24 is pivotally coupled to the tower boom 18 at the tower boom nose pin 22. A suitable lifting mechanism 26 such as a hydraulic cylinder drives a position of the main boom 24 relative to the tower boom 18. See page 6, lines 8-12. In contrast with conventional articulating boom lift vehicles, the tower boom 18 and the main boom 24 are preferably without a conventional upright between them. Instead, the

boom lift vehicle 10 of the invention utilizes sensing structure for sensing an angle of the main boom, preferably relative to gravity. For example, an inclinometer 30 may be attached to the tower boom 18 for measuring an angle of the tower boom 18 relative to gravity. A rotation sensor 32 is coupled between the tower boom 18 and the main boom 24 for determining a relative position of the tower boom 18 and the main boom 24. A control system 34 controls lift and telescope functions of the tower boom 18 and the main boom 24. See page 6, lines 15-28.

The control system 34 controls tower lift and telescope functions in order to control a path of the tower nose pin 22 through a predetermined path. A tower length sensor communicates with the control system 34 to determine a telescope length of the tower boom 18. A single control switch shown schematically at 36 in Fig. 1 effects raising and lowering of the tower boom, and the control system 34 automatically controls tower lift and telescope functions to follow the predetermined path depending on the main boom angle. See page 6, line 29 – page 7, line 6.

Fig. 2 illustrates the nominal tower boom path controlled via the control system 34. The tower path is a fixed relationship of tower length and tower angle (preferably relative to gravity) and is variable only by the angle of the main boom 24. Fig. 3 schematically illustrates differences in the tower path with different main boom angles. See page 7, lines 7-15.

Movement of the main boom 24 will cause the control system 34 to adjust the tower path accordingly. See page 7, lines 16-21.

The control system 34 controls the path 38 of the tower nose pin 22 by simultaneously controlling pivoting of the tower boom 18 relative to the vehicle base 12 and telescoping of the tower boom 18. In this manner, the controlled nominal tower boom path shown in Fig. 2 can be effected, whereby the tower boom 18 can be raised to its max position considerably faster than with conventional arrangements. Pivoting of the tower boom 18 relative to the vehicle base 12 and telescoping of the tower boom 18 are controlled such that the nose pin 22 predetermined path follows (1) a constant radius equal to a fully retracted length of the tower boom 18 for tower boom angles (+/-) less than a predetermined angle determined relative to gravity, and (2) a substantially straight line tangent to the constant radius for tower boom angles greater than the predetermined angle. See page 7, line 22 – page 8, line 11.

An angle of the main boom 24 relative to the tower boom 18 is controlled by maintaining the main boom angle, preferably relative to gravity, as measured at (1) the commencement of a tower lift control, or (2) a conclusion of a main boom lift command when the main boom 24 is active with a tower lift command. When tower lift down is commanded, the control system 34 maintains the main boom angle according to the noted parameters unless the minimum angle with respect to the tower 18 has been reached, at which point the minimum angle with respect to the tower boom 18 is maintained. See page 8, lines 22-28.

Fig. 4 is a flow chart showing the method of the invention.

The control system 34 controls the main boom 24 when the tower boom 18 is below the tower boom elevation angle to maintain a main boom angle relative to gravity at a first set point angle. The first set point angle is determined as the main boom angle (1) at a start of the swing function or vehicle drive, or (2) at a conclusion of the main lift function when combined with at least one of the swing function or vehicle drive. When the tower boom 18 is above the tower boom elevation angle, the control system 34 controls the tower boom 18 to maintain a tower boom angle relative to gravity at a second set point angle. The second set point angle is determined as the tower boom angle (1) at a start of the main lift function, the main telescope function, the swing function or vehicle drive, or (2) at a conclusion of the tower lift function when combined with at least one of the main lift function, the main telescope function, the swing function or vehicle drive. See page 9, line 23 – page 10, line 4.

SPECIFIC SUPPORT FOR INDEPENDENT CLAIMS

1. A method of controlling a tower boom path in a boom lift vehicle, the boom lift vehicle including a telescoping tower boom pivotally coupled at one end to a vehicle base, and a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom **[see page 6, lines 1-12]**, the method comprising raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length **[see page 7, lines 7-15]**, wherein pivoting of the tower

boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously and independently such that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom **[see page 7, line 7 – page 8, line 11]**.

3. A method of controlling a tower boom path in a boom lift vehicle, the boom lift vehicle including a telescoping tower boom pivotally coupled at one end to a vehicle base, and a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom **[see page 6, lines 1-12]**, the method comprising raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length **[see page 7, lines 7-15]**, wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously such that the tower boom nose pin follows a predetermined path, and wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are controlled such that the nose pin predetermined path comprises (1) a constant radius equal to a fully retracted length of the tower boom for tower boom angles less than a predetermined angle relative to gravity, and (2) a substantially straight line tangent to the constant radius for tower boom angles greater than the predetermined angle relative to gravity **[see page 7, line 7 – page 8, line 11]**.

6. A method of controlling lifting functions in a boom lift vehicle, the boom lift vehicle including a telescoping tower boom pivotally coupled at one end to a vehicle base, and a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom **[see page 6, lines 1-12]**, the method comprising raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length **[see page 7, lines 7-15]**, wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously and independently such that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom **[see page 7, line 7 – page 8, line 11]**.

10. A boom lift vehicle comprising:

a vehicle base **[see page 5, lines 22-26]**;

a telescoping tower boom pivotally coupled at one end to the vehicle base **[see page 6, lines 1-7]**;

a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom **[see page 6, lines 8-12]**; and

a control system controlling positioning of the tower boom and the main boom, the control system being configured for raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle

base and by telescoping the tower boom **[see page 6, line 8 – page 7, line 6]**, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length, wherein the control system effects pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom simultaneously and independently such that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom **[see page 7, line 7 – page 8, line 11]**.

19. A boom lift vehicle comprising:

a vehicle base **[see page 5, lines 22-26]**;

a telescoping tower boom pivotally coupled at one end to the vehicle base **[see page 6, lines 1-7]**;

a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom **[see page 6, lines 8-12]**; and

a control system controlling positioning of the tower boom and the main boom, the control system being configured for raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom **[see page 6, line 8 – page 7, line 6]**, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length,

wherein the boom lift vehicle is without an upright between the tower boom and the main boom **[see page 6, lines 15-28]**, and wherein the control system effects pivoting

of the tower boom relative to the vehicle base and telescoping of the tower boom simultaneously and independently such that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom **[see page 7, line 7 – page 8, line 11]**.

22. A method of controlling a tower boom path in a boom lift vehicle, the boom lift vehicle including a telescoping tower boom pivotally coupled at one end to a vehicle base, and a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom **[see page 6, lines 1-12]**, the method comprising raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length **[see page 7, lines 7-15]**, wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously such that the tower boom nose pin follows a predetermined path **[see page 7, line 7 – page 8, line 11]**, and wherein the predetermined path is varied based on an angle of the main boom relative to gravity **[see page 6, lines 15-28, page 8, lines 22-28 and page 9, lines 6-15]**.

(VI) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether claims 1-22 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 5,257,177 to Bach et al. in view of U.S. Published Patent Application No. 2003/0173151 to Bodtke.

2. Whether claims 1-17 and 22 are unpatentable under 35 U.S.C. §103(a) over Bach in view of U.S. Patent No. 4,179,010 to Ashworth

3. Whether claims 2, 9 and 11 are unpatentable under 35 U.S.C. §103(a) over Bach in view of Bodtke or Ashworth and U.S. Patent No. 5,390,104 to Fulton.

(VII) ARGUMENT

1. Claims 1-22 are not unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 5,257,177 to Bach et al. in view of U.S. Published Patent Application No. 2003/0173151 to Bodtke.

Independent Claims 1, 6, 10, 19, 22

The Office Action provides that "Bach teaches the claimed method but although showing at 2 and 3 lifts having a plurality of booms is silent on same, thus the claimed difference being a work equipment having a pivotally attached main boom." The Office Action, however, does not provide any support for its conclusion nor does the Office Action reference any teaching in Bach aside from lifts "2 and 3" that purportedly "teaches the claimed method." The "lifts" 1-3 in Bach show articulated and/or telescoping booms, but Bach makes no mention of a machine with a tower boom or even a single characteristic of such a machine. Rather, Bach discloses using sensors to measure piston positions to use in determining a boom angle. Bach endeavors to provide a path control arrangement for hydraulically movable work equipment that maintains a desired path of movement. The path of movement is divided into individual movement sequences from one desired position to a next desired position within a predetermined tolerance band. These desired positions, however, do not relate to any predetermined path of a tower boom nose pin, but the positions rather are those controlled by the operator or in an automatic mode to move the work equipment along a straight line.

Nowhere does the Bach patent even remotely disclose a predetermined path of a tower boom nose pin that varies based on an angle of a main boom.

Appellants thus respectfully disagree that "Bach teaches the claimed method . . . ." Indeed, Bach lacks at least the claimed steps of raising and lowering a tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom. Bach additionally lacks the step wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously and independently such that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom.

The Bodtke publication does not correct these deficiencies. Bodtke describes that an operator positions the platform 206 at a desired elevation "by controlling the angle and/or extension of one or both of the primary and secondary booms 201 and 202 relative to the chassis 204." See, e.g., page 5, lines 18 and 19. In this context, not only does the Bodtke publication similarly lack a teaching of the claimed simultaneous and independent pivoting and telescoping, but Bodtke also lacks any teaching of performing pivoting and telescoping such that a tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom as defined in independent claims 1, 6, 10, 19, 22.

According to this aspect of the claimed invention, assuming the main boom is set at an angle A, the tower boom nose pin path is controlled in a predetermined manner.

This nose pin path would be the same in every instance that the main boom angle is set at angle A. If the main boom is set at a second angle B, the nose pin path may be different, but each instance that the main boom angle is set at angle B, the nose pin path would remain the same. At least this concept is lacking in Bach and Bodtke, taken singly or in combination.

Appellants thus respectfully submit that the rejection of independent claims 1, 6, 10, 19, 22 should be withdrawn.

Independent Claim 3

Independent claim 3 defines a method wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously such that the tower boom nose pin follows a predetermined path, and pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are controlled such that the nose pin predetermined path comprises (1) a constant radius equal to a fully retracted length of the tower boom for tower boom angles less than a predetermined angle relative to gravity, and (2) a substantially straight line tangent to the constant radius for tower boom angles greater than the predetermined angle relative to gravity.

In this context, the Office Action dismisses these specifically defined method steps as "an obvious mechanical expediency in view of the capability and function of [Bodtke's] control arrangement with memory means." Mere structural capability, however, is not sufficient to render the specifically defined method steps obvious. Using this logic, it would seem that few if any process inventions would ever be patentable.

Without conceding that the structure performing the claimed method steps is known, Appellants submit that novel process steps should not be denied patentability if performed by known structure "capable" of performing them. For example, since computers are programmable to carry out programs, using the Examiner's logic, every computer-implemented invention would be unpatentable since a computer is "capable" of performing any process. (See, for example, *Ex parte Levengood*, 28 USPQ2d 1300, 1301–02 (B.P.A.I. 1993)("That which is within the capabilities of one skilled in the art is not synonymous with obviousness."))

Although Bodtke references the use of an independent reference frame 241, 641 represented by a horizontal line normal to the direction of gravitational force, Bodtke lacks any disclosure or suggestion of a nose pin predetermined path defined by (1) a constant radius equal to a fully retracted length of the tower boom for tower boom angles less than a predetermined angle relative to gravity, and (2) a substantially straight line tangent to the constant radius for tower boom angles greater than the predetermined angle relative to gravity. That is, claim 3 specifically defines a nose pin path as a constant radius up to a predetermined tower angle, then a straight line tangent to the constant radius above the predetermined angle. In contrast, Bodtke describes that the operator basically has autonomous control over the position of the platform until the angle of inclination 244 reaches a predetermined angle. It is clear then that Bodtke lacks at least any such nose pin predetermined path including a constant radius below a predetermined boom angle relative to gravity.

Appellants thus respectfully submit that the rejection of claim 3 should also be withdrawn.

Dependent Claims

With regard to the dependent claims, Appellants submit that these claims are allowable at least by virtue of their dependency on an allowable independent claim.

Dependent Claims 2, 9 and 11

Moreover, with regard to the single control switch defined in claims 2, 9 and 11, although these claims are included in the rejection, the Office Action does not reference a single teaching in a single reference that purportedly meets this feature of the invention. Indeed, neither Bach nor Bodtke discloses such subject matter.

Dependent Claim 8

Still further, claim 8 recites that the step of controlling an angle of the main boom relative to the tower boom comprises maintaining the boom angle relative to gravity as measured at (1) the commencement of a tower lift control, or (2) the conclusion of a main boom lift command when the main boom is active with a tower lift command. The Office Action also fails to address this feature of the invention. Bach is silent with regard to such subject matter. Additionally, as noted above, although the Bodtke publication utilizes a reference line relative to gravity, Bodtke does not disclose or suggest a step of controlling an angle of a main boom relative to the tower boom by maintaining the boom angle relative to gravity as measured at (1) the commencement of a tower lift control or

(2) the conclusion of a main boom lift command when the main boom is active with a tower lift command.

Dependent Claim 21

Claim 21 recites that the sensing means includes an inclinometer attached to the tower boom that measures an angle of the tower boom relative to gravity, and a rotation sensor coupled between the tower boom and the main boom that determines a relative position of the tower boom and the main boom. The control system determines the main boom angle relative to gravity based on output from the inclinometer and the rotation sensor. The Office Action contends that "Bodtke at 662, 661 teaches the use of sensing means position at a tower boom and between the tower and main boom." In this context, however, Appellants submit that merely because inclinometers and rotation sensors may be known, it would not have been obvious from the prior art of record to use such components in the specifically claimed configuration. An obviousness conclusion on this basis is the product of improper hindsight. Indeed, none of the applied references discloses or suggests the claimed inclinometer attached to a tower boom that measures an angle of a tower boom relative to gravity, and a rotation sensor coupled between a tower boom and a main boom that determines a relative position of the tower boom and the main boom.

Even assuming the Examiner's characterizations of the applied references are accurate, the purported fact that "Bodtke at 662, 661 teaches the use of sensing means position at a tower boom and between the tower and main boom" still falls short of the

invention defined in claim 21. The claimed configuration requires an inclinometer that measures an angle of the tower boom relative to gravity and a rotation sensor that determines a relative position of the tower boom and the main boom.

Reversal of the rejection is respectfully requested.

2. Claims 1-17 and 22 are not unpatentable under 35 U.S.C. §103(a) over Bach et al. in view of U.S. Patent No. 4,179,010 to Ashworth.

Independent Claims 1, 6, 10, 19 and 22

As discussed above, Bach does not reference a machine including a tower boom or any movement of a tower boom in conjunction with a main boom. Ashworth merely discloses a conventional main boom that is pivotally attached to a tower boom. Ashworth replicates a simple single boom design with a jib. The Office Action again dismisses the specific steps of the claimed invention as "an obvious mechanical expediency in view of the capability and function of [Ashworth's] control arrangement with memory means." As noted above, this basis is not sufficient to support the grounds of rejection. Ashworth does not disclose or suggest in any manner a control system or method having any remote similarities to the claimed invention.

Independent Claim 3

With regard to claim 3, Ashworth similarly lacks the method steps of claim 3, which defines a nose pin path as a constant radius up to a predetermined tower angle, then a straight line tangent to the constant radius above the predetermined angle.

Ashworth lacks any such nose pin predetermined path including a constant radius below a predetermined boom angle relative to gravity.

Dependent Claims

With regard to the dependent claims, Appellants submit that these claims are allowable at least by virtue of their dependency on an allowable independent claim.

Dependent Claims 2, 8, 9 and 11

Moreover, although included in the rejection, the subject matter of claims 2, 9 and 11 is not addressed in the grounds of rejection. Still further, like the Bodtke patent referenced above, Ashworth similarly lacks the subject matter of claim 8, defining the step of controlling an angle of the main boom relative to the tower boom by maintaining the boom angle relative to gravity as measured at (1) the commencement of a tower lift control, or (2) the conclusion of a main boom lift command when the main boom is active with a tower lift command. The Office Action includes this subject matter in the unsupported and baseless conclusion that these features are "obvious mechanical expedients."

Reversal of the rejection is respectfully requested.

3. Claims 2, 9 and 11 are not unpatentable under 35 U.S.C. §103(a) over Bach in view of Bodtke or Ashworth and U.S. Patent No. 5,390,104 to Fulton.

The Office Action cites the Fulton patent to purportedly meet the features of dependent claims 2, 9 and 11. As noted above, these claims are also rejected in the prior grounds of rejection over Bach in view of Bodtke and Bach in view of Ashworth. By

including this rejection in the Office Action, it is not clear whether the Examiner intended to include these claims in the prior rejections. If so, it is not readily clear why this additional rejection is necessary; if not, the prior rejections are per se misplaced as lacking proper grounds.

Moreover, Fulton discloses an "adaptive control man-augmentation system" that controls the movement of a suspended work station. The device includes structure that detects movement of a directing member relative to certain axes and produces outputs related to such movement to produce movement of a work station. The example described in the specification relates to a fruit picking apparatus where a directing member is connected to the picker's body, and when horizontal movement is required, the picker leans or reaches in the desired direction of movement, resulting in matching directional movement of the platform at a rate proportional to his angle of part positioning. Independent positioning of the various platform support components directly contrasts the control system and method of the invention. That is, the Fulton patent lacks at least the claimed subject matter wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously and independently such that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom. As such, Appellants submit that these dependent claims are allowable at least by virtue of their dependency on an allowable independent claim.

Still further, the "go button" switch 71 described in the Fulton patent is described as a "deadman" switch that presumably allows the controls to remain live while engaged. Such a switch does not cause the machine to follow a predetermined path, and even assuming somehow it could be interpreted to follow a predetermined path, this path would not vary based on an angle of the main boom..

Reversal of the rejection is thus respectfully requested.

CONCLUSION

In conclusion it is believed that the application is in clear condition for allowance; therefore, early reversal of the outstanding rejections and passage of the subject application to issue are earnestly solicited.

Respectfully submitted,

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(VIII) CLAIMS APPENDIX

1. A method of controlling a tower boom path in a boom lift vehicle, the boom lift vehicle including a telescoping tower boom pivotally coupled at one end to a vehicle base, and a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom, the method comprising raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length, wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously and independently such that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom.

2. A method according to claim 1, wherein the raising and lowering of the tower boom is controlled with a single control switch.

3. A method of controlling a tower boom path in a boom lift vehicle, the boom lift vehicle including a telescoping tower boom pivotally coupled at one end to a vehicle base, and a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom, the method comprising raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a

maximum boom length, wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously such that the tower boom nose pin follows a predetermined path, and wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are controlled such that the nose pin predetermined path comprises (1) a constant radius equal to a fully retracted length of the tower boom for tower boom angles less than a predetermined angle relative to gravity, and (2) a substantially straight line tangent to the constant radius for tower boom angles greater than the predetermined angle relative to gravity.

4. A method according to claim 3, wherein the predetermined angle is less than 10° relative to gravity.

5. A method according to claim 3, wherein the predetermined angle is about 6.6°.

6. A method of controlling lifting functions in a boom lift vehicle, the boom lift vehicle including a telescoping tower boom pivotally coupled at one end to a vehicle base, and a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom, the method comprising raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length, wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously and independently such

that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom.

7. A method according to claim 6, further comprising controlling an angle of the main boom relative to the tower boom based on a position of the tower boom.

8. A method according to claim 7, wherein the step of controlling an angle of the main boom relative to the tower boom comprises maintaining the main boom angle relative to gravity as measured at (1) the commencement of a tower lift control or (2) the conclusion of a main boom lift command when the main boom is active with a tower lift command.

9. A method according to claim 6, wherein the raising and lowering of the tower boom is controlled with a single control switch.

10. A boom lift vehicle comprising:

a vehicle base;

a telescoping tower boom pivotally coupled at one end to the vehicle base;

a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom; and

a control system controlling positioning of the tower boom and the main boom, the control system being configured for raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom

length, wherein the control system effects pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom simultaneously and independently such that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom.

11. A boom lift vehicle according to claim 10, further comprising a single control switch coupled with the control system to effect the raising and lowering of the tower boom.

12. A boom lift vehicle according to claim 10, wherein the control system is configured to control pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom such that the nose pin predetermined path comprises (1) a constant radius equal to a fully retracted length of the tower boom for tower boom angles less than a predetermined angle, and (2) a substantially straight line tangent to the constant radius for tower boom angles greater than the predetermined angle.

13. A boom lift vehicle according to claim 12, wherein the predetermined angle is less than 10° relative to gravity.

14. A boom lift vehicle according to claim 12, wherein the predetermined angle is about 6.6°.

15. A boom lift vehicle according to claim 10, wherein the control system is configured to effect control of an angle of the main boom relative to the tower boom based on a position of the tower boom.

16. A boom lift vehicle according to claim 15, wherein the control system is further configured to control an angle of the main boom relative to the tower boom by maintaining the main boom angle relative to gravity as measured at (1) the commencement of a tower lift control or (2) the conclusion of a main boom lift command when the main boom is active with a tower lift command.

17. A boom lift vehicle according to claim 10, further comprising means for sensing an angle of the main boom relative to gravity.

18. A boom lift vehicle according to claim 17, wherein the sensing means comprises:

an inclinometer attached to the tower boom, the inclinometer measuring an angle of the tower boom relative to gravity; and

a rotation sensor coupled between the tower boom and the main boom, the rotation sensor determining a relative position of the tower boom and the main boom,

wherein the control system determines the main boom angle relative to gravity based on output from the inclinometer and the rotation sensor.

19. A boom lift vehicle comprising:

a vehicle base;

a telescoping tower boom pivotally coupled at one end to the vehicle base;

a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom; and

a control system controlling positioning of the tower boom and the main boom, the control system being configured for raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length,

wherein the boom lift vehicle is without an upright between the tower boom and the main boom, and wherein the control system effects pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom simultaneously and independently such that the tower boom nose pin follows one of a plurality of predetermined paths depending on an angle of the main boom.

20. A boom lift vehicle according to claim 19, further comprising means for sensing an angle of the main boom relative to gravity.

21. A boom lift vehicle according to claim 20, wherein the sensing means comprises:

an inclinometer attached to the tower boom, the inclinometer measuring an angle of the tower boom relative to gravity; and

a rotation sensor coupled between the tower boom and the main boom, the rotation sensor determining a relative position of the tower boom and the main boom,

wherein the control system determines the main boom angle relative to gravity based on output from the inclinometer and the rotation sensor.

22. A method of controlling a tower boom path in a boom lift vehicle, the boom lift vehicle including a telescoping tower boom pivotally coupled at one end to a vehicle base, and a main boom pivotally coupled to a tower boom nose pin at an opposite end of the tower boom, the method comprising raising and lowering the tower boom between a fully retracted position and a raised position by pivoting the tower boom relative to the vehicle base and by telescoping the tower boom, the raised position including any position up to a maximum angle of the tower boom relative to the vehicle base and a maximum boom length, wherein pivoting of the tower boom relative to the vehicle base and telescoping of the tower boom are performed simultaneously such that the tower boom nose pin follows a predetermined path, and wherein the predetermined path is varied based on an angle of the main boom relative to gravity.

(IX) EVIDENCE APPENDIX

(NOT APPLICABLE)

(X) RELATED PROCEEDINGS APPENDIX

(NOT APPLICABLE)